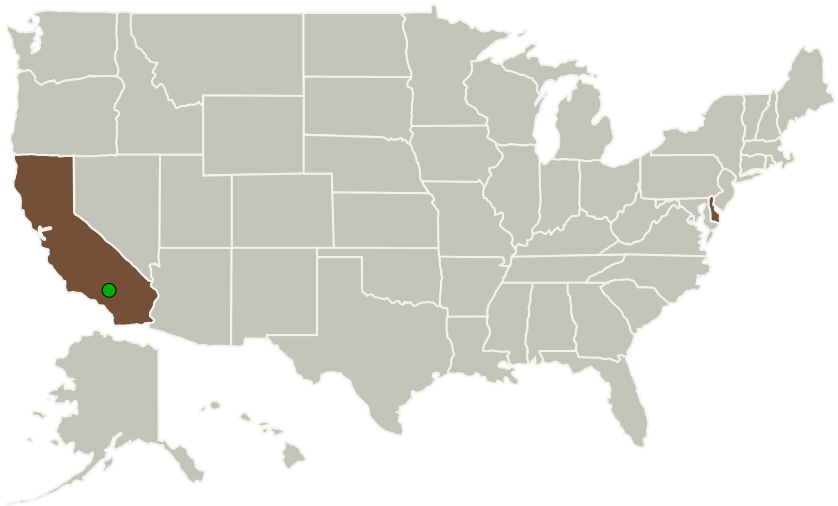
Advanced Long-Range Video Capabilities Using Speckle Imaging Techniques, Phase II

Completed Technology Project (2013 - 2015)

Project Introduction

Flight-testing is a crucial component in NASA's mission to research and develop new aeronautical concepts because it allows for verification of simulated and wind-tunnel experiments and exposes previously unforeseen design problems. Video is an invaluable tool for flight-testing, allowing the collection of a wealth of information such as craft position, speed, health, as well as tracking different phases of flight, capturing events, extracting performance figures, and documenting historical flights. For several cases of interest (high-speed/high-altitude aircraft, lakebed remote landings, vehicle re-entry, smoke airflow traces, etc.) it is not feasible or physically possible to install external cameras close to the aircraft whose behavior is being filmed. Long-range imaging equipment is typically used in these cases, but the captured footage is severely limited in quality by atmospheric effects, which are often the dominating source of image degradation, long before diffraction-related limitations occur. In consequence, long-range imagery typically suffers from scintillation, blurring, poor spatial resolution, and low contrast. Since these problems result from atmospheric conditions, they cannot be overcome by simply improving imaging hardware. What is needed is a solution to combat atmospheric distortion. In Phase I, EM Photonics demonstrated a signal processing technique based on initial research from Lawrence Livermore National Laboratory. We modified and implemented this core algorithm and showed its ability to enhance imagery collected from the long-range imaging systems at NASA DFRC. In Phase II, we will evolve and integrate the prototype components developed in Phase I and deliver an image enhancement device capable of running in real time to mitigate the image distortion present in data collected from NASA DFRC's long-range cameras.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
EM Photonics, Inc.	Lead Organization	Industry	Newark, Delaware
Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations	
California	Delaware

Project Transitions

July 2013: Project Start

July 2015: Closed out

Images

Project Image
Advanced Long-Range Video Capabilities Using Speckle Imaging Techniques
(https://techport.nasa.gov/image/126512)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
EM Photonics, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

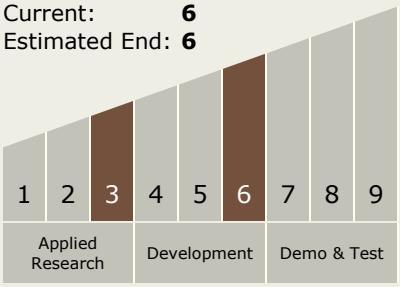
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Petersen Curt

Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



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Technology Areas

Primary:

- TX13 Ground, Test, and Surface Systems
  - TX13.2 Test and Qualification
    - TX13.2.4 Verification and Validation of Ground, Test, and Surface Systems

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System